APPENDIX.

Since the earlier parts of this article were printed, a number of additional specimens of some of the species have been received. Some of these are of importance, as affording additional information in regard to the genera and species, and will, therefore, be mentioned here.

I have also received from Professor J. Steenstrup two recent pamphlets,* relating to the *Ommastrephidæ* and *Teuthidæ*, printed subsequently to the publication of the pages relating to those families in this article. As these refer directly to the genera and species herein described, they may well be briefly noticed here.

Ommastrephes, Sthenoteuthis, Illex, etc.

Professor Steenstrup, in the first paper referred to, has given a revision of the Ommastrephes-group. He divides the old genus *Ommastrephes* into three genera, viz: I. ILLEX, which includes *O. illecebrosus*, with *Coindetii*, the closely allied Mediterranean form; II. TODARODES, which includes only the well-known *Ommastrephes todarus* of the Mediterranean, to which he restores the name *sagittatus* Lamarck, which has been otherwise employed by other authors during half a century past; III. OMMATOSTREPHES† (restricted), which corresponds exactly with *Sthenoteuthis*‡ previously established by me. (These Trans., p 222, February, 1880).

* De Ommatostrephagtige Blæksprutter indbyrdes Forhold <Oversight over d. k. D. Vidensk. Selsk. Forhandl., 1880. Presented, April, 1880. [Author's edition received Aug., 1880].

Professor A. E. Verrils [sic] to nye Cephalopodslægter, Sthenoteuthis og Lestoteuthis. Bemærkninger og Berigtigelser, 1 pl. ["avec un résumé en Francais," not received]. From the same, 1881. Advance copy received by me, through the kindness of the author, is dated, in MSS., March 3, 1881.

† I can see no necessity for the proposed reformation of the original spelling of this word by changing it to "*Ommatostrephes*," for usage justifies the elision of a syllable in so long a name. The original spelling has been in good use for over forty years.

‡ Professor Steenstrup also quotes *Cycria* Gray, 1849 (ex Leach MSS.), as a synonym of *Ommastrephes* as restricted, = *Sthenoteuthis*. But in reality it was evidently intended for a group equivalent to *Ommastrephes*, in the extended sense, and as a complete synonym, never in use, it should be dropped. *Hyaloteuthis* Gray, if used at all, should be used in the limited sense, for a minor group, as originally intended.

In another part of this article he refers* to my paper, which had been promptly sent to him, but he makes no reference whatever to the genus *Sthenoteuthis*, nor to the species, *S. megaptera*, which, as a species, had been described by me still earlier (1878) and in far greater detail than most of the other species which he mentions, and which should, under his system of classification, bear the name of *Ommastrephes megaptera.* Nor does he point out any new characters for distinguishing this generic group other than those first given by me, viz: the presence of connective suckers and tubercles on the tentacular arms proximal to the club, and the great development of the membranes on the lateral arms.

Under the ordinary rule of nomenclature, by which the first correct subdivision made in an older genus shall be entitled to priority, while the original name shall be retained for the remaining group, the name *Sthenoteuthis* ought to be maintained for the division first established by me, while *Ommastrephes* (restricted) should be retained for a part or all of the remaining species.† While I very much regret this confusion of names, I perceive no way to remedy it except by the application of the usual rules of priority.

As for the distinction between *Illex* and *Todarodes*, it seems to me very slight and scarcely of generic importance. *Illex* is characterized by having eight rows of small suckers on the distal part of the club, and a smooth siphonal groove. *Todarodes* is characterized by having four rows of distal suckers and some small grooves or furrows at the anterior end of the siphonal groove.

But I have a species (which I refer to *O. Sloanei* Gray), from Tasmania, which agrees with *Illex* in having a smooth siphonal groove, but with *Todarodes* in having only four rows of distal tentacular suckers, and in the sharp denticulation of its large suckers. According to Steenstrup's system this would have to be made still another genus, or else his generic characters would have to be greatly

* In discussing (p. 233, foot note) my statements in respect to the sexual differences in proportions. It is to be hoped that Prof. Steenstrup will find in the tables of measurements given in the preceding pages all the data needed to settle this matter more satisfactorily.

† Professor Steenstrup considers *O. Bartramii* as the "typical" species of *Ommastrephes.* But in fact D'Orbigny did not give any particular species as the *type* of his genus. His description applies better to such forms as *O. todarus* and *O. illecebrosus*, for he does not mention the connective tubercles and suckers of the tentacular arms. Nor is it certain that *O. gigas*, one of the earliest species referred to this genus, has such structures. The species thus named, even by Professor Steenstrup, is so called only with a mark of doubt.

changed in order to admit it into either of his groups. The existence of eight rows of suckers in '*Illex*' seems to be due merely to the crowding together of the ordinary four rows; nor can we attach much importance to the superficial furrows in the siphon-groove. Therefore, my own opinion still is that *Illex* and *Todarodes* should be reunited, and should retain the name *Ommastrephes*, in a restricted sense. The absence of connective suckers and tubercles on the tentacular arms will be the most important diagnostic character to distinguish it from *Sthenoteuthis* and *Architeuthis*.

In this paper, Professor Steenstrup gives figures (cuts) which, with the descriptive remarks, will, at last, enable others to identify his *S. pteropus* with more certainty. He has given diagramatic cuts of the base of the tentacular clubs, showing the arrangement of the connective suckers and tubercles of *S. pteropus*, *S. Bartramii*, *S. gigas*, *S. pelagicus*, *S. oualaniensis*, and *Dosidicus Eschrichtii* [p. 11], and cuts [p. 9], showing the siphonal grooves of *Sthenoteuthis pteropus*, *S. Bartramii*, *S. pacificus*, *Ommastrephes sagittatus* (="*O. todarus*"), and *O. Coindetii* (="*O. sagittatus*," auth.). On pp. 19 and 20 he has given a synoptical table of the several genera that he recognizes in this group, which he names, *Ommatostephini* (= *Ommastrephidæ* Gill, Tryon, Verrill). On plate 3, he figures "*Illex Coindetii*," female, with the gill-cavity opened, showing a large cluster of spermatophores attached to the inner surface of the mantle, behind the base of the gill, and a smaller one, in front of the gill.

In the second article referred to, Professor Steenstrup discusses the genus *Sthenoteuthis* versus "*Ommatostrephes*." He recognizes the identity of *Sthenoteuthis* and his restricted genus *Ommatostrephes*, as well as the priority of date of the former. He also refers to *S. megaptera*, as "*Ommatostrephes megaptera*."

Lestoteuthis= *Cheloteuthis*= *Gonatus* Steenst. (non Gray).

The second of Professor Steenstrup's papers contains a detailed discussion of *Gonatus Fabricii* Steenst., with which he also unites *Onychoteuthis Kamtschatica* Midd., the type-species of my genus *Lestoteuthis* (see p. 250). He may be correct in uniting these forms, for he states that he has received specimens that agree with *Gonatus Fabricii*, from the North Pacific.* Moreover, taking the characters of the genus *Gonatus*, as *now understood*, by Professor

* The figures, however, show differences in the form of the pen and caudal fin which, if correct, may still indicate specific differences.

Steenstrup, the description and figures of Middendorff's species apply well to that genus, and my description of *Lestoteuthis* well defines *Gonatus* Steenst., except for the mistake in regard to the tip of the pen. But when I proposed the genus *Lestoteuthis*, no writer had ever so described *Gonatus*, and the data necessary for the correlation of the two species *did not exist* in the literature of the subject. I have already alluded (pp. 290–292 and elsewhere), to some of the very serious errors of Gray, H. & A. Adams, and others, as to the *generic* and even *family* characters of *Gonatus*.* Professor Steenstrup, in his last paper, has exposed a greater number of errors, some of which are questionable. He has, however, been fortunate in securing specimens of larger size and in better condition than those examined by other writers, and has given good figures and a very full exposition of the characters of this very interesting species. Two excellent specimens were taken by our party, this season, on the "Fish Hawk." One of these is an adult male; the other is young, with the mantle 30^{mm} long. The latter agrees well in size and form with the specimen described and figured by G. O. Sars, as *Gonatus amœnus*, while the former† agrees with Steenstrup's figure of the adult *G. Fabricii*. But both differ decidedly from a Cumberland Gulf specimen, which is doubtless the *real Gonatus amœnus* Gray, and has four rows of true suckers on all the arms, and no hooks. It does not appear that Steenstrup has seen this form.

The fortunate acquisition of these specimens has enabled me to ascertain, for myself, not only that Professor Steenstrup is correct in considering two forms that have been described from the North

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* The genus *Gonatus*, as established by J. E. Gray, if we judge by his description, was a very different group from what Steenstrup understands by it. Among the false characters given by him are the following: 1, It was said to have no eyelids; 2, to have no valve in the siphon; 3, to have no siphonal dorsal band. But he also says that it has nearly equal and similar suckers in four series, on all the arms, "all with small circular rings"; and the club was said to have "ranges of small, nearly sessile, equal-sized cups," with one "large sessile cup, armed with a hook in the middle of the lower part." From the fact that he received his specimens from Greenland (coll. Möller), we must believe that he actually had before him the real *G. amœnus!* My specimen from Cumberland Gulf has true suckers, as described by Gray, *on all the arms*.

Most of Gray's errors have been copied and adopted by Woodward, H. & A. Adams, Tryon, and many other writers.

† I have had figures of the larger specimen made by Mr. Emerton, for my Report on the Cephalopods, now printing in the Report of the U. S. Fish Commission, for 1879. Some of these are also reproduced on Plate LV, figs. 1–1*d*.

Atlantic, as simply the young and adult of the same species, but also that all the essential and peculiar features of the armature, both of the sessile and of the tentacular arms, including the special, lateral connective suckers and tubercles of the club, are present, though minute, even in the very young individuals, such as described by G. O. Sars. The fact that these characters have been overlooked is undoubtedly due, in many cases, to the imperfectly preserved specimens that have been examined. This was, at least, the case with the only American specimens seen by me until this year. They had all been taken from fish stomachs, and had lost more or less of their suckers and hooks.

A careful direct comparison of the adult *G. Fabricii*, with the mutilated specimen which was last year described by me as *Cheloteuthis rapax*, has convinced me that they are identical, and, therefore, *Cheloteuthis* becomes a synonym of *Lestoteuthis*. Two of the characters, viz: the supposed presence of two central *rows of hooks* on the ventral, as well as on the lateral arms, and the supposed *absence* of the small marginal suckers on the lateral arms, relied upon for characterizing *Cheloteuthis*, were doubtless due to post-mortem changes. The ventral arms had lost the horny rings of the suckers, and the soft parts had taken a form exceedingly like that of the sheaths of the hooks of the lateral arms. But by the careful use of reagents I have been able to restore the original form of some of the distal ones sufficiently to show that they actually were sucker-sheaths. The third character, originally considered by me as more reliable and important, was the existence of the peculiar, lateral connective suckers and alternating tubercles on the tentacular club. This is *now* shown by Professor Steenstrup to be a character of his *Gonatus*. But no one had previously described such a structure in connection with that genus. Even in the recent and excellent work of G. O. Sars, in which "*G. amœnus*" is described in some detail, and freely illustrated, there is no indication of any such structure, although the armature of the club is figured (see my Pl. 45, fig. 1*b*), nor is the difference between the armature of the ventral and lateral arms indicated.*

I add a new description of the genus *Lestoteuthis*, and also of my largest example of *L. Fabricii*.

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*According to Gray, in *Gonatus* all the sessile arms bear four rows of similar and nearly equal suckers; according to G. O. Sars they all have two central rows of sucker-hooks. My description (p. 290) was based mainly on the figures and description of G. O. Sars, my only specimen, at that time, being an imperfect young one.

Lestoteuthis Verrill, (revised).

Gonatus Steenstrup, op. cit., pp. 9–26, (non Gray).
Gonatus Verrill, this volume, pp. 250, 290, 1880, (non Gray).
Lestoteuthis Verrill, this volume, p. 250, Feb., 1880.
Cheloteuthis (*Chiloteuthis* by typ. error) Verrill, this volume, p. 292, Jan., 1881.
Cheloteuthis Verrill, Bulletin Mus. Comp. Zool., viii, p. 109, March, 1881.

Odontophore with only five rows of teeth.* Mandibles very acute, strongly compressed. Lateral connective cartilages of the mantle are simple ridges; those of the siphon ovate. Nuchal olfactory crests one or more on each side, longitudinal. Caudal fin, of adult, large, spear-shaped. Ventral arms with four rows of denticulated suckers. No trace of hectocotylization detected.† Lateral and dorsal arms with two marginal rows of small suckers and two median rows of large hooks. Tentacular arms with a central row of hooks, the two distal ones largest; with a large distal and two lateral groups of small suckers, in numerous rows; and with a lateral group of peculiar connective suckers, alternating with tubercles, near the lower margin, and a row of smaller ones extending for a long distance down the margin of the arm; upper margin of the arm with a band of small, pediceled suckers along about half its length. Pen narrow, with a short, hollow, posterior cone.

Gonatus Gray, typical, (non Sars, Steenst.) differs in having four rows of true suckers, similar on all the arms. This may be a sexual character, but the two forms should be kept separate, awaiting farther evidence. Steenstrup does not give the sex of his specimens.

Lestoteuthis Fabricii (Licht.) Verrill. (See pp. 291–294.)

? Onychoteuthis Kamtschatica Middendorff, 1849.
Gonatus Fabricii Steenstrup (*pars*), in Mörch, Faunula Molluscorum Ins. Færöerne, Vid. Meddel. nat. For., 1867, p. 102; Faunula Mollusc. Islandiæ, Vid. Meddel. nat. For. Kjöbenhavn, 1868, p. 227.
Gonatus Fabricii Mörch (*pars*), in T. R. Jones, Arctic Manual, p. 130, 1875.
Steenstrup, Oversigt over d. Kongl. D. Vidensk. Selsk. Forh., 1881. [Sep. copy, p. 26,] pl. 1, figs. 1–7.
Verrill, (*pars*) this volume, p. 291.
Cheloteuthis rapax Verrill, this volume, p. 293, pl. 49, figs. 1–1^{f}; Bulletin Mus. Comp. Zool., viii, p. 110, pl. 2, figs. 1–1^{f}, 1881; Report U. S. Fish Com. for 1879, p. [76], pl. 15, figs. 3–3^{f}, 4, dentition, 1881.
Lestoteuthis Fabricii Verrill, Report of U. S. Fish Com. for 1879, p. [79], pl. 15, figs. 1–1^{c}, 2–2^{d}, pl. 45, figs. 1–1^{d}, 1881.

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* The dentition of the type-specimen of *Cheloteuthis rapax* was figured and described by me, several months ago, in the report of the U. S. Fish Com., for 1879.

† My largest specimen, although apparently adult, is not sexually mature. An older specimen might be hectocotylized.

PLATE XLV, FIG. 1–2*d*. PLATE XLIX, FIG. 1–1*f*. PLATE LV, FIG. 1–1*d*.

Body elongated, tapering to an acute posterior end; anterior edge of mantle nearly even dorsally, with a slight median emargination; lateral angles well-marked, in line with the internal connective cartilage, which forms a long, simple, longitudinal ridge. Caudal fin broad spear-shaped, broadest in advance of the middle; the lateral angles are well rounded; the tip is very acute; the anterior lobes are broadly rounded, projecting forward beyond the insertion. Head large, short and broad; eyes large, occupying most of the sides of the head; eye-lids well developed, thickened, with a narrow, oblique sinus. Siphon large, in a deep groove, with two stout, dorsal bridles; lateral connective cartilages large, long-ovate, posterior end broadest. One olfactory crest on each side, behind the eye, in the form of a low, longitudinal membrane; slight indications of another, lower down; a small, fleshy, flattened, projecting papilla near the auditory opening. The outer buccal membrane has seven distinct angles. Arms rather long and strong; trapezoidal in section. The dorsal arms are considerably shorter than the others; order of length is 1, 2, 4, 3; the 3d is but little longer than the second pair; ventral arms decidedly more slender than the others.

Ventral arms with four rows of denticulated suckers, those of the two inner rows larger; lateral and dorsal arms with two marginal rows of small suckers and two inner rows of larger incurved hooks, enclosed, except at the sharp tips, in muscular sheaths, which have lateral basal expansions and short pedicels (Pl. LV, fig. 1*b*). Tentacular arms* long and strong, quadrangular; in my specimen they reach back beyond the base of the fin; the club is large and broad, with a long, narrow distal portion, having a strong dorsal keel; in the middle are two very large, curved hooks (fig. 1, 1*a*), the distal one smaller; proximal to these there is a row of five smaller hooks, decreasing proximally, and between these and the large hooks there is, on one arm, a single small sucker; on the other arm a single sucker takes the place of the proximal hook, while an odd, small sucker stands to one side of the row; along the upper margin of the club there is a broad band of small, denticulated suckers, on long pedicels, arranged in oblique, transverse rows of five or six; this band of suckers is interrupted opposite the large hooks; beyond the hooks

* The figure given (pl. XLIX, fig. 1,) of the somewhat injured tentacular club of the type of *Cheloteuthis rapax*, represents the structure nearly correctly, but many of the small suckers and tubercles on the arm, below the club, had been destroyed, the edge above *e'* is injured, and of the large hooks (*a*, *a'*) only the sheaths remain.

a large group of similar small suckers covers nearly the whole distal portion of the club (Pl. LV, fig. 1); at the tip of the club there is a circle of small smooth suckers; along the lower margin of the middle portion of the club there is a band of small suckers, like those on the other margin; along the basal third of the margin and supported on a thickened marginal expansion of the club, there is a row of six special, smooth, connective suckers, at the inner ends of transverse, muscular ridges (fig. 1, *e*); between and alternating with these suckers, there are deep pits and as many small, round tubercles, destined to fit the suckers and ridges of the other club; continuous with these a row of similar, but smaller, sessile, connective suckers and tubercles extends down along the margin of the inner face of the arm, for about half its length, becoming smaller and more simple proximally; an irregular band, formed of two or three rows of small, pediceled and denticulated suckers, extends down the other margin of the arm, with some scattered ones along the middle.

The pen (Pl. LV, fig. 1*d*) is thin, long and narrow; anterior part about half as wide as the middle portion, slender, concave, with thickened margins; the anterior end is very thin, acute; the two marginal ribs converge gradually, as they run backward, and unite near the posterior end; the widest part of the pen is a little behind the middle; the thin margins begin at about the anterior third, gradually increasing in width to the widest part, when they still more gradually decrease posteriorly; but toward the end they expand into the obliquely hooded portion, or terminal hollow cone; this portion is strengthened by a dorsal mid-rib, and by numerous small ribs which radiate forward from the tip, one on each side being stronger than the rest. In life, the cone contained part of the testicle, and at the tip a cartilaginous core. Length of pen, in alcohol, 133^{mm}; greatest breadth, 7^{mm}; of shaft, 2·5^{mm}; length of cone, on shortest side, 7^{mm}.

General color of body, fins, head and arms, deep reddish brown, tinged with purple; back darkest; the color is due to large chromatophores rather uniformly and closely scattered over the whole surface; on the arms and siphon they are smaller, but they cover all the surfaces of the arms, except the lower side of the tentacular arms and the face of the club. Total length, 263^{mm} (10·25 inches); length of mantle, 153^{mm} (6 inches); length of dorsal arms, 57^{mm}; of 2d pair, 71^{mm}; of 3d pair, 77^{mm}; of 4th pair, 70^{mm}; of tentacular arms, 100^{mm}; length of tail, from insertion, 63^{mm}; from anterior lobe, 70^{mm}; greatest breadth, 68^{mm}; breadth of head, 29^{mm}.

Notes on the visceral anatomy of the male.

In its anatomy this species resembles *Ommastrephes.* The branchial cavity is very large, extending back nearly to the base of the fin; the median longitudinal septum is far back, gills very long, but not reaching the margin of the mantle, attached nearly to the tip; its structure is like that of *Ommastrephes.* Liver orange-brown, very large, massive, nearly as in *Ommastrephes*, but larger, extending back farther than the base of the fin. The circulatory and renal systems are similar to those of *Ommastrephes*, in most respects. The posterior aorta goes back some distance before it divides, about opposite the base of the fin, into the medio-ventral artery of the mantle, and a caudal artery. Two large ventral renal organs lie below and to each side of the heart, and blend together, in front of it, into a large mass, which has a pointed lobe extending forward; posteriorly two lobes extend back, as usual, along the posterior venæ-cavæ. The first stomach is rounded and the second stomach is a large, long-pyriform sac; the intestine is long, the ink-sac is long-pyriform. The reproductive organs are small, indicating that the specimen is still immature, and probably only one year old. The spermary or "testicle" is small (length 18^{mm}, diameters 2^{mm} and 4^{mm}), flattened, tapering backward, partly enclosed by the hooded portion of the pen, and with the anterior end attached laterally to the posterior end of the cæcal lobe of the stomach. The prostate gland, vesiculæ-seminales and spermatophore-sac are small; the efferent duct is long and slender, extending forward over and beyond the base of the left gill.

Moroteuthis, gen. nov.

Type, *Onychoteuthis* (or *Lestoteuthis?*) *robusta*, this vol., pp. 246–250.

Moroteuthis robusta Verrill, Report of the U. [redacted]ish Commission for 1879, pp. [65–71], pls. 13 and 14, 1881.

After referring the type of *Lestoteuthis* to *Gonatus* (not of Gray), Professor Steenstrup admits that the gigantic species, *L. robusta* V., is the representative of a distinct genus, to which he would restrict the name *Lestoteuthis.*

But *L. Kamtschatica* was specially given by me as *the type of Lestoteuthis,* and the characters of the genus were derived entirely from that species, while *L. robusta* was referred to it only with great doubt, owing to the fact that its armature is almost unknown. Therefore, if *Lestoteuthis* hereafter becomes a complete synonym, it should be dropped, when it cannot be kept for its special type-species. For the gigantic species I have proposed (Am. Jour. Sci., xxii, p. 298, Oct., 1881,) a new genus, *Moroteuthis.*

This genus will have, as known characters: A long, narrow, thin pen, terminating posteriorly in a conical, hollow, many-ribbed, oblique cone, which is inserted into the oblique, anterior end of a long, round, tapering, acute, *solid*, cartilaginous terminal cone, composed of concentric layers, and corresponding to the solid cone of *Belemnites* in position and relation to the true pen; elliptical connective cartilages on the base of the siphon; nuchal, longitudinal crests, three, much as in *Ommastrephes;* eye-lids with a distinct sinus; caudal fin large, broad, spear-shaped, ventral arms with smooth-rimmed suckers at the base. The rest of the armature is unknown.

Moroteuthis robusta is the only known species.

Architeuthis Harting, 1861. (See pp. 197, 238, 239.)

Architeuthus Steenstrup, Förhandl. Skand. Naturf., 1856, vii, p. 182, 1857 (no description).

The characters of this genus, as given on p. 197, must be modified, so far as the *pen* is concerned, in accordance with the description given below.

Professor Steenstrup, in the second of the papers above cited (see p. 385) criticises me (and others) for writing Architeuth*i*s instead of Architeuth*u*s, as he originally spelled the word. So far as I am personally concerned, I am free to confess that I had always supposed that his original spelling was a typographical error, and as the genus at that time was merely *named*, but in no sense *established* nor *defined*, as a matter of necessity I adopted the name as spelled in the earliest published work (that of Harting), in which the characters of the genus were so far indicated as to make it possible to recognize it. Harting states that he was in correspondence with Professor Steenstrup, in regard to this genus, and that he had received from him drawings and proofs of unpublished plates of *Architeuthis*. Therefore, the blame, if any, for the change in spelling, must rest mainly with Harting. Moreover, Gervais, who had seen and briefly described Professor Steenstrup's specimens, also wrote *Architeuthis*, and that has been the general practice with nearly all European writers, for twenty years. Therefore, I do not see the propriety of specially criticising Mr. Tryon and myself for using this spelling, which has been so extensively adopted in Europe.

That the original form of the word would have been preferable, I do not deny. But that there is any special impropriety in the termination *teuthis*, even for a *large* cephalopod, it is useless to insist upon, for that termination has been generally adopted by many writers, and during many years, for several genera, living and fossil,

of both large and small cephalopods. Thus Professor Steenstrup, himself, notwithstanding his demonstration of the etymological absurdity of the names, uses "*Enoploteuthis*," "*Lestoteuthis*" for genera that include species about as *large* and *powerful* as *Architeuthus*. Although *teuthis*, in classical Greek, may signify a *small* and *weak* cephalopod, as a zoological term it no longer has that meaning. But if the change had not been made by others, apparently with good reasons, I should certainly not have adopted it, for it is not in accordance with my practice to change or "reform" the original spelling of generic or specific names, unless for very urgent and obvious reasons.

On the tentacular club of this and numerous other related genera, there is a peculiarity that I have not seen definitely described. Between the rows of large suckers there is, as described already, a central zigzag ridge, which sends off transverse ridges between the suckers, defining shallow pits around each sucker-pedicel. These pits are lined, however, with a thin, partially free membrane, which surrounds the base of the pedicel, like a collar, leaving an open space on all sides, except the inner, where it is attached to the pedicel. The space beneath this membrane freely communicates with the spaces beneath the other sucker-pits, by means of open spaces beneath the zigzag central and transverse ridges.

A similar structure, but less developed, exists in *Ommastrephes*, *Histioteuthis*, *Loligo* and other genera. These collar-like membranes are probably able to embrace and support the pedicels, when the suckers are in action.

Architeuthis Harveyi Verrill. (See pp. 197, 259.)

Since the publication of the descriptions of this species I have made a more thorough examination of the various mutilated fragments of the pen, and have compared them more fully with the corresponding parts of the pen, in other genera. From these studies I became convinced that the portions of the pen formerly supposed by me to belong to the anterior, really belong to the posterior end.* Consequently the description on pages 206–208, should be corrected by substituting posterior for anterior, throughout, with other concordant changes. The explanation of the figure (Pl. XV, fig. 3) should also be corrected, in the same way. To correct this mistake

* The description of the pen was corrected in my Report on Cephalopods (pp. 31–33] in the Report of the U. S. Fish Commissioner, put in type last year.

more effectually, I here give a new description of the pen, based on these fragments, arranged as I now understand the form and structure.

New description of the pen of Architeuthis Harveyi V.

The parts preserved all belong to the posterior blade, which is now flattened and much mutilated, but it was very thin and broad, running out to attenuated borders; and it apparently had a small, acute, hooded terminal portion, or thin hollow cone, perhaps only two or three inches long, while the broad blade itself must have been more than two feet long and upward of a foot wide, when flattened out. No part of the narrow anterior shaft, which probably existed, is preserved.

The extreme posterior end is gone, but the convergent ribs indicate that it tapered to a point; each edge of the present end, for rather more than an inch, is thickened by a more divergent marginal rib, running into the edge and disappearing, while the edges here appear to have been torn apart, and this portion appears to have constituted the hooded portion; beyond this the margins run out to a very thin and ill-defined edge. The midrib, or dorsal keel, is at first sharply angular with a triangular section, and the slender lateral costæ are completely confluent with it, but a little farther forward these begin to become distinct and slightly divergent, till at about ten inches from the end they are about an inch from the midrib; except close to the posterior end, the midrib is regularly rounded, or nearly semi-cylindrical. Near the posterior end there are three or four other slightly thickened, divergent ribs, on each side, between the midrib and the margin, but all these, except the inner ones, soon run obliquely to the margins and disappear; probably these mark the portion that was incurved or partially hooded. The surface is marked by fine striæ between and parallel to the ribs, but the oblique, divergent striæ, so conspicuous in *Sthenoteuthis*, are scarcely apparent. The midrib has nothing of the double or grooved character seen in that of *Sthenoteuthis* and *Ommastrephes*, the divergent ribs are much less numerous, and the whole structure is much more thin and flexible and the marginal portions much more ill-defined and membranous.

Architeuthis abundant in 1875 *at the Grand Banks.*

From Capt. J. W. Collins, now of the United States Fish Commission, I learn that in October, 1875, an unusual number of giant-squids were found floating at the surface on the Grand Banks, but

mostly entirely dead, and more or less mutilated by birds and fishes. In very few cases they were not quite dead, but entirely disabled. These were seen chiefly between north latitude 44° and 44° 30′, and between west longitude 49° 30′ and 49° 50′. He believes that between 25 and 30 specimens were secured by the fleet from Gloucester, Mass., and that as many more were probably obtained by the vessels from other places. They were cut up and used as bait for codfish. For this use they are of considerable value to the fishermen. Captain Collins was at that time in command of the schooner "Howard," which secured five of these giant-squids. These were mostly from 10 to 15 feet long, not including the arms, and averaged about 18 inches in diameter. The arms were almost always mutilated. The portion that was left was usually 3 to 4 feet long, and at the base, about as large as a man's thigh.

One specimen (No. 25), when cut up, was packed into a large hogshead-tub having a capacity of about 75 gallons, which it filled. This tub was known to hold 700 pounds of codfish. The gravity of the *Architeuthis* is probably about the same as that of the fish. This would indicate more nearly the actual weight of one of these creatures than any of the mere estimates that have been made, which are usually much too great. Allowing for the parts of the arms that had been destroyed, this specimen would probably have weighed nearly 1,000 pounds.

Among the numerous other vessels that were fortunate in securing this kind of bait, Captain Collins mentions the following:

The schooner "Sarah P. Ayer," Captain Oakley, took one or two.

The "E. R. Nickerson," Captain McDonald, secured one that had its arms, and was not entirely dead, so that it was harpooned. Its tentacular arms were 36 feet long (No. 26).

The schooner "Tragabigzanda," Captain Mallory, secured three in one afternoon. These were 8 to 12 feet long, not including the arms.

These statements are confirmed by other fishermen, some of whom state that the "big squids" were also common during the same season at the "Flemish Cap," a bank situated some distance northeast from the Grand Banks.

The cause of so great a mortality among these great Cephalopods can only be conjectured. It may have been due to some disease epidemic among them, or to an unusual prevalence of deadly parasites or other enemies. It is worth while, however, to recall the fact that these were observed at about the same time, in autumn, when most of the specimens have been found cast ashore at New-

foundland in different years. This time may, perhaps, be just subsequent to their season for reproduction, when they would be so much weakened as to be more easily overpowered by parasites, disease, or other unfavorable conditions.

I have heard of no authentic instances* of the occurrence of specimens of this species since the finding of the small specimen (No. 24), in April, 1880. [See p. 259.]

Large Species from New Zealand.

Architeuthis Mouchezi ? (See p. 243.)

Mr. T. W. Kirk, in the Transactions of the Wellington Philosophical Society, for October, 1879, p. 310, has published accounts of the occurrence of five specimens of "giant cuttle-fish" on the coast of New Zealand:

No. 1. The first of these was cast ashore at Waimarama, east coast, in September, 1870. Of this the beak was preserved and sent to Mr. Kirk by Mr. Meinertzhagen, whose account of the occurrence, with a rather crude description and some measurements made by an eye-witness, Mr. Kirk has printed. He gives no description of the beak, unfortunately. The dimensions given are as follows: Length from tip of tail to root of arms, 10 feet 5 inches; circumference, 6 feet; length of arms, 5 feet 6 inches. "The beast had eight tentacles, as thick as a man's leg at the root; horrid suckers on the inside of them, from the size of an ounce bullet to that of a pea at the tip; two horrid goggle eyes; and a powerful beak between the roots of the arms. His head appeared to slip in and out of a sheath. Altogether he was a most repulsive looking brute."

It is probable that this specimen had lost its two tentacular arms before death, and that it was actually of the same species as the other specimens recorded by Mr. Kirk. Mr. Kirk, however, seems to think that the above description refers to an Octopod.

No. 2. "The beak of number 2 was deposited in the Colonial Museum by Mr. A. Hamilton. The animal was captured at Cape Campbell by Mr. C. H. Robson, a member of this society, who very kindly furnished me with the following information. Writing on the 19th of June, 1879, he says:

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* A purely fictitious and sensational account of an imaginary capture of an *Architeuthis* has been published in Lippincott's Magazine, for Aug., 1881, p. 124, by Mr. Charles F. Holder.

"'In reply to yours of the 12th about the cuttle-fish, I may state that while stationed at Cape Campbell I found several specimens of large size, all, however, more or less mutilated, except one, the beak of which I gave to Mr. Hamilton. It was alive and quite perfect, the body being 7 feet long, eight sessile arms 8 feet long, and two tentacular arms 12 feet long. I am, however, only writing from memory. Mr. Hamilton has the exact measurements, and I remember distinctly that the total length was close on 20 feet.'

"I am sorry to say that Mr. Hamilton has mislaid the notes and measurements, but those given above cannot be far out."

No. 3. The third specimen was examined and measured by Mr. Kirk, personally, where it lay on the beach. He made a drawing of it, which has not yet been published, to my knowledge. It was found on the beach at Lyall Bay, May 23, 1879, by three boys. Mr. Kirk states that it had been somewhat mutilated by the natives before he saw it, and the pen or bone had been cut across; but he preserved all the pieces of the pen, the beak, tongue, and some of the suckers. Most of the suckers had been torn off.

"The length of body from tip of tail to anterior margin of the mantle was 9 feet 2 inches, and 7 feet 3 inches in circumference; the head from anterior margin of mantle to roots of arms, 1 foot 11 inches; making the total length of the body 11 feet 1 inch. The head measured 4 feet in circumference. The sessile arms measured 4 feet 3 inches in length, and 11 inches in circumference. Each of these arms bore thirty-six suckers, arranged in two equal rows (as shown by the scars), and measuring from $\frac{1}{16}$ to $\frac{1}{4}$ of an inch in diameter. Every sucker was strengthened by a bony ring armed with from forty to sixty sharp incurved teeth. The tentacular arms had been torn off at the length of 6 feet 2 inches, which was probably less than half their original length."

"The fins were posterior, and were mere lateral expansions of the mantle. They did not extend over the back, as in the case with *Onychoteuthis*, &c. Each measured 24 inches in length and 13 inches in width.

"The cuttle-bone, when first extracted, measured 6 feet 3 inches in length and 11 inches in width, but has since shrunk considerably. It was broadly lanceolate, with a hollow conical apex $1\frac{1}{8}$ inches deep."

No. 4. "Another specimen, measuring 8 feet in length, was lately caught by a fishing party near the Boulder Bank, at Nelson, concerning which I have only seen a newspaper cutting, and have not been able to obtain particulars."

No. 5. "A fifth was found by Mr. Moore, near Flat Point, east coast. A description was sent to Mr. Beetham, M. H. R., who, I believe, intends communicating it to this society."

From the above descriptions, alone, it is not possible to decide with certainty whether these specimens belong to the *Architeuthis*-group, or whether they are more nearly allied to the *Onychoteuthis*-group, like *Moroteuthis*, for the armature of the tentacular arms is not known. The broad-lanceolate form of the pen, with a small conical hood at the end, would seem to indicate affinities with *Architeuthis*, and the presence of true suckers, on the sessile arms, and small size of the fins, are favorable for that view. Altogether, the descriptions indicate that this New Zealand species is related to, and perhaps identical with, the one discovered at the Island of St. Paul, and first named by M. Vélain *Architeuthis Mouchezi*. It is to be hoped that Mr. Kirk will soon give detailed descriptions and figures of the portions in his possession.

Plectoteuthis grandis Owen = Architeuthis grandis.

Plectoteuthis grandis Owen, Descriptions of some new and rare Cephalopoda, Part II.<Trans. Zool. Soc. London, xi, part 5, p. 156, pl. 34, 35, June, 1881.

Professor Owen, in the paper quoted, has given a somewhat detailed description, with figures, of the large cephalopod arm, long preserved in the British Museum, and which had previously been pretty fully described by Mr. Saville Kent, in 1874, whose description has already been quoted by me (see pp. 241, 242). Professor Owen, like Mr. Kent, fails to state to which pair of arms the specimen belongs. This is a very important omission, for in *Architeuthis*, as in many other genera, the arms belonging to different pairs differ in form and structure. The describers of this arm would doubtless have been able to ascertain to which pair it belonged by a direct comparison with the arms of *Ommastrephes*, or any other related form.

For this arm, Professor Owen endeavors to establish a new genus and species (*Plectoteuthis grandis*). The genus is based mainly on the fact that there is a marginal crest along each outer angle, and a narrow protective membrane along each side of the sucker-bearing face. These peculiarities are precisely those seen in the *ventral arms* of *Architeuthis*, and have already been described by me in former articles, and in this report (see pp. 214, 261, 262), both as found in *A. Harveyi* and *A. princeps*. Similar membranes or crests are found

on the *dorsal* arms of *Sthenoteuthis pteropus* (see Pl. XXXVI, fig. 7, *a*) and other related species.

The suckers on the arm, as described and figured by Professor Owen, are like those of *Architeuthis*. Therefore, there is no ground whatever for referring this arm *to any other genus*, and *Plectoteuthis* must, therefore, become a synonym of *Architeuthis*.

Whether the arm in question belongs to a species distinct from those already named, I am unable to say. There is, apparently, nothing to base *specific* characters upon except the form of the suckers and of their horny rings. But the description of the horny rings is not sufficiently precise, nor the figures sufficiently detailed, to afford such characters. If the arm is one of the ventral pair, as seems probable, the suckers as figured by Professor Owen, and especially as more fully described by W. Kent, agree very closely, but not perfectly, with those of either of the Newfoundland specimens, for in the latter the suckers of the ventral arms are strongly toothed externally, but are either entire, or in some cases, only slightly denticulated on the inner side. But they also agree well with those of the *Architeuthis Hartingii*, as figured by Harting. Those of the original *A. dux* Steenst., have neither been described nor figured. In Owen's figures the large suckers are represented as denticulated pretty evenly all around the edge. As this arm cannot, at present, be referred with certainty to any of the named species, it may be best to record it as *Architeuthis grandis*, until better known.

In the same article Professor Owen has given a good figure (pl. 33, fig. 2) of the tentacular arm of the Newfoundland specimen (my No. 2) copied from the same photograph described by me (see pp. 182, 208, 209). To this he applies, doubtless by mistake, the name, *Architeuthis princeps*,* without giving any reason for not adopting my conclusion that it belongs to *A. Harveyi*. But he does not, in any way, refer to the latter species, although he mentions the specimen (my No. 5), or rather the photograph of the specimen, on which that species was based. He apparently (on page 162) supposes that both photographs and all of Mr. Harvey's measurements refer to the same

* By a singular mistake, Professor Owen, on page 163, states that this species was named *A. princeps* by Dr. Packard, in February, 1873. But according to his own statement, on page 161, the specimen was not actually obtained till December, 1873, *at least nine months after* Dr. Packard's article was printed. In truth, the name *princeps* was first given by me in 1875, to designate a pair of large jaws, as explained on page 210. Neither this nor any other name appears on the cited page of Dr. Packard's article, though he elsewhere referred these jaws doubtfully to *A. monachus*.

specimen, which is by no means the case, as had been sufficiently explained by me in several former papers.*

The brief account given by Professor Owen of the large Cephalopods described by others, includes none additional to those noticed by me in this report. On the other hand, he omits those described by Harting; those described by Mr. Kirk, from New Zealand; those from Alaska; and several others.

Sthenoteuthis Verrill (see pp. 222, 286.)

Xiphoteuthis (sub-genus) Owen, op. cit. p. 104, pl. 28, figs. 1, 2, June, 1881 (*non* Huxley).

In the paper referred to above,† Professor Owen has described a cephalopod, without locality, under the name of *Ommastrephes ensifer*, for which he proposes the sub-generic name *Xiphoteuthis*. His species is a typical example of my genus *Sthenoteuthis* (1880) and appears to be identical, in every respect, with *S. pteropus* (see p. 228, Pl. XXXVI, figs. 5–9, and Pl. LIV, figs. 2, 2*a*), as described by me. But Professor Owen fails to mention one of the most characteristic features of this group of squids, viz: the connective tubercles and smooth suckers on the proximal part of the tentacular club, nor is his figure sufficiently detailed to indicate this character, nor even the actual arrangement and structure of the other suckers of the club. The high median crest and broad marginal web of the third pair of

* It seems incredible that Professor Owen could have made these mistakes had he examined either of my former papers in which these specimens have been described in detail, not only from the photographs, but from the preserved specimens. He does, however, refer to Part I, of this article, published in 1880. But as he states (p. 162) that in it "a brief notice is given of Mr. Harvey's squid" it is fair to suppose that the reference is taken at second-hand, for it is not to be supposed that he would have considered my description, covering over 20 pages, and accompanied by nine plates, as a "*brief notice.*" None of my earlier papers are referred to, nor does he mention the large species, *Moroteuthis robusta*, in his account of the large Cephalopods hitherto described.

† Among other species figured and described in this paper, there is a handsome species from the China Sea, described as *Loligopsis ocellata*, sp. nov. (pp. 139–140, pl. 26, figs. 3–8, pl. 27, figs. 1, 2).

This is evidently not a true *Loligopsis* and belongs, in all probability, to my genus *Calliteuthis*. It agrees very closely, even to the coloration, and the form of the fins and pen, with my *C. reversa*, but differs in having serrate suckers. This species should, therefore, be called *Calliteuthis ocellata*. It is much larger than my specimen, but like the latter, had lost the tentacular arms. The genus probably belongs to the Chiroteuthidæ.

arms are well shown, but these are about equally broad in *S. pteropus* and *S. megaptera*, and are also present in all the related species of this group.

Owen's specimen had a total length of 3 feet; length of body, 15 inches; of head to base of dorsal arms, 3·7; of third pair of arms, 12; of tentacular arms, 21; breadth of caudal fin, 12·6; length of their attached bases, 6·6; breadth of body, 5; length of 1st, 2d, 3d, 4th pairs of arms, 8·9, 11, 12, and 9·6 inches, respectively. The specimen is a female. It agrees very closely in size with the Bermuda specimen described by me, and its proportions do not differ more than is usual with alcoholic specimens of any species, preserved under different circumstances, and in alcohol of different strength. The original specimen of *S. megaptera* is considerably larger.

Ommastrephes illecebrosus V. (See p. 268.)

This species was taken in many localities, this year, by the U. S. Fish Commission, in deep water, off Martha's Vineyard. Most of the living specimens were young, but large ones were often taken from the stomachs of bottom-dwelling fishes, in the same region, showing conclusively that it regularly inhabits those depths.

Additional Specimens examined.

Station.	Locality.	Fath.	Date.	Rec'd from	Specimens. No. Sex.
	Off Martha's Vineyard.		1881.	U. S. F. C.	
918	S. ½ W. 61 m. f. Gay Head.	45	July 16.	"	1 l., from fish.
919	" 65 "	51½	"	"	2 l., from Lophius.
923	" 78½ "	96	"	"	3 juv.
924	" 83½ "	110	"	"	5 juv.
925	" 86 "	224	"	"	1 juv.
939	S. by E. ½ E. 98 "	258	Aug. 4.	"	1 l.; 1 juv.
940	" 97 "	130	"	"	1 l.; 1 juv.
949	S.W. 79½ "	100	Aug. 23.	"	1 l., in Lopholatilus.
1025	S.S.W. ½ W. 95 "	216	Sept. 8.	"	1 l., in fish.
1033	S.S.E. ½ E. 106 "	183	Sept 14.	"	1 l., in Merlucius.
1038	S. by E. ½ E. 89½ "	146	Sept. 21.	"	1 l.
	Newfoundland.	Surf'e	1880.	Osborn	3 l. ♂; 10 l. ♀.

Mr. H. L. Osborn, in the American Naturalist, vol. xv, p. 366, May, 1881, has given an account of the habits of this squid, at Newfoundland, and of the methods of capturing it there, for bait.

Enoploteuthis Cookii Owen. (See p. 241.)

Enoploteuthis Cookii Owen, Trans. Zool. Soc. London, xi, p. 150, pl. 30, figs. 1–3, pl. 31. figs. 1–4, pl. 32, figs. 1–6, pl. 33, fig. 1 (restoration), June, 1881.
Seppia unguiculata Molina, 1810 (no description).
Enoploteuthis Molinæ D'Orbigny, Ceph. Acétab., p. 339, 1845–1848.
? Enoploteuthis Hartingii Verrill, this vol., p. 241, pl. 24, figs. 4–4*b*, 1880.

Professor Owen has very recently described in detail and has given excellent figures of most of the existing parts of this large and remarkable cephalopod, which have so long been preserved and have so often been referred to, but hitherto have never been scientifically described. (See p. 241). It is to be regretted, however, that Professor Owen has neither described nor figured the teeth of the radula, in a manner to enable it to be used as a systematic character. His statement in regard to it is only of the most general kind, and shows only that there are seven rows of teeth. It is also a matter of surprise that he has not compared any of the described portions with the corresponding parts of an equally large and very closely allied *Enoploteuthis* carefully described and figured by Harting in 1861 (see p. 241), and to which I have given the well-merited name, *E. Hartingii.*

It is not improbable that the two forms are really identical, but this cannot be certainly determined from the figures, because the corresponding parts are not always represented in the same positions, and it is uncertain whether the corresponding arm is preserved in the two cases.

Harting figures, rather poorly, the teeth of the radula, which appear to be very peculiar, if his figure is correct (see my Pl. XXIV, fig. 4*b*).

The shape of the mandibles appears to be different in the two species, however, and the large hooks also differ in form.

Histioteuthis Collinsii Verrill. (pp. 234, 300).

The teeth of the odontophore, originally described and figured (p. 237, Pl. XXXVII, fig. 5), were not the most developed of those on the same odontophore. On the middle and best developed parts, the bases of the central and inner lateral teeth, when seen in a front view, are broader than indicated in the former figures, in which they are seen nearly in profile. The median tooth has a long, acute, central denticle, but no distinct lateral denticles, the broad, short base having the outer angles only slightly prominent, or not at all so; the inner lateral teeth are nearly as large, with one similar large denticle,